

Exploring the Manifestation of Empathy within Engineering Innovation and Design

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The study of empathy within engineering has potential to improve the education of innovative and ethically-oriented engineers through the application of empathically guided engineering principles and processes. However, the collective understanding of the role of empathy within engineering is minimal. Hence, the purpose of these two distinct but aligned investigations was to understand how empathy manifests within engineering innovation and design. Specifically, the guiding research questions included: (1) “In what manner and to what extent does empathy predict innovative behavioral tendencies?”, and (2) “In what ways does empathy manifest throughout design?”

To address the initial research question, we disseminated two validated instruments (the Interpersonal Reactivity Index and Innovative Behavioral Scales) to students at a large, public, mid-western university. Through a series of multiple regression analyses, we found that that cognitive empathy types (e.g., perspective-taking, fantasy) showed a more pronounced relationship with innovative behavioral tendencies (e.g., questioning, idea networking, observation) than affective empathy types (e.g., empathic concern, personal distress).

To address the second research question, we thematically analyzed a set of critical events extracted from eight videos that featured nine STEM students who participated in a three-week service-learning course at the same university. Through our analysis, we found four categories with 12 underlying themes that represented empathically-oriented techniques designers utilized to develop a user-centric empathic understanding, as well as how these informed their creation of design criteria, outcomes, and evaluation of those outcomes.

Taken together, the results indicate that empathy is highly salient within engineering, and that emphasizing this salience throughout engineering programs and organizations could change broader societal images to demonstrate the relevance of empathy to engineering design and innovation. This, in turn, might attract more empathically-inclined students to engineering.